

flocks was relatively small, as both visual and telemetry data indicated that the vast majority of birds were concentrated in the southern one-half of the area we surveyed (Figs. 2 and 3).

Location

Most spectacled eiders observed during this survey were concentrated within a circle 37 km in diameter and centered in Ledyard Bay at 69°22'N, 164°22'W, which is 67 km southwest of Point Lay and 41 km from the nearest shore (Fig. 1). Similarities between eider flock distributions on the two survey dates, and between those distributions and the locations of implanted birds from ARGOS data (Fig. 2 and 4), suggest that birds remained within a limited area, despite wind and water currents; a phenomenon that has been noted elsewhere for this species (Larned et al. 1995a).

Origin of birds present in Ledyard Bay

We believe most eiders in Ledyard Bay were associated with the Alaskan arctic coastal plain breeding grounds, based on the bay's physical location, and on telemetry data indicating that all but two successfully-breeding Prudhoe Bay females molted in Ledyard Bay. Of the two exceptions among Prudhoe Bay females, one was present in Ledyard Bay on 10 September, but moved to the vicinity of Cape Deshnev on the Chukotsk Peninsula, Russia by 14 September. The other stopped briefly in Ledyard Bay about 17 September, then moved to near the eastern end of St. Lawrence Island about 21 September. Telemetry data suggest that male eiders may also use post-breeding habitats other than those nearest their current breeding habitat. A male implanted with satellite transmitter in the Indigirka River Delta, Russia in June 1995 arrived in Ledyard Bay in early August, and a male implanted on the Yukon-Kuskokwim Delta in June 1994 appeared in Ledyard Bay in late June, 1994 (Fig. 2). Telemetry data so far indicate that most spectacled eiders use traditional molting areas nearest their breeding grounds. However, the occasional movements between post-breeding habitats, along with observations of large early winter aggregations of birds near St. Lawrence Island (Larned et al. 1995b) strongly support the hypothesis suggested by Dau and Kistchinski (1977), that Russian and Alaskan breeding populations winter together in the Bering Sea.

Sex ratios

After completing the grid survey, we flew back over several concentrations of eiders and took oblique photographs to obtain sex ratios. The birds were still undergoing the body molt, so the contrast between males and females was not as distinct as it would be later in the fall, and molt stage varied between individuals. Our impression was that most adult males were distinguishable from females in both flying and swimming postures by their distinctly lighter heads and white wing patches, though most retained some darker eclipse plumage on the neck and back. Birds that we interpreted as subadult males, however, retained more dark plumage on the head, neck, and back, and were difficult to distinguish from females except in flight, when the well-developed white wing patches were visible. It was difficult to achieve proper photographic exposure of the eiders scattered in a vast background of water that varied from nearly flat black to bright white from sun glare, especially at this transitional time of year when contrast between the sexes is minimal. We obtained 28 usable images containing 2279 birds, of which we classified 1945, or 85.3 percent, as males. Percent males varied among individual photos from 63.8 to 98.0, with a standard error of 9.4 percent. These results for our sample

are probably biased slightly low for males, as some swimming subadult males, and all juvenile males, would be classified as females based on overall plumage color. However, the photographed sample, which was selected from the densest concentration of flocks, may have been biased toward males, as we noted that most large flocks were predominately males, while many smaller, scattered flocks were comprised of brown-phase eiders, presumably females and young of the year. No obvious family groups were represented in the photos. These data are difficult to interpret, and we would hesitate to assign a precise value to the overall sex ratio, but it was obvious that males predominated in Ledyard Bay.

Other Species

Survey time did not permit a great deal of effort expended on other species. We encountered black guillemots in winter plumage scattered sparsely throughout the survey area. At the outer (western) edge of the survey grid, and beyond as far as we could see, were rafts of large dark birds that appeared to be shearwaters, though we were not able to positively identify them. Other species present in small numbers were yellow-billed, Pacific, and red-throated loons, black-legged kittiwakes, Sabine's gulls, glaucous gulls, whales, seals, and Pacific walrus (Tables 1 and 2).

RECOMMENDATIONS

The extreme inconsistency in our counts between two days having different weather and surface conditions underscores the importance of careful planning, patience, and persistence in executing off-shore surveys to increase accuracy and comparability of results.

Specific recommendations are as follows:

1. Include the Ledyard Bay molting habitat in a spectacled eider population monitoring program.
2. Place transmitters on male spectacled eiders on the Alaskan arctic coastal plain, and conduct aerial surveys in Ledyard Bay in July to determine whether or not males and non-breeding or failed-breeding females use this area immediately after nest initiation, to help measure the breeding/non-breeding components of the female population, and to help reconcile the post-breeding population estimates with the breeding population estimates.
3. Investigate prey resources and food habits of spectacled eiders in Ledyard Bay.

LITERATURE CITED

- Dau, C. P., and S. A. Kistchinski. 1977. Seasonal movements and distribution of the spectacled eider. *Wildfowl* 28:65-75.
- Larned, W. and B. McCaffery. 1993. Norton Sound eider survey, August 30-31, 1993. Unpublished trip report. U.S. Fish and Wildlife Service. Anchorage, Alaska. 8pp.
- Larned, W., M. R. Petersen, K. Laing, R. Platte, and J. I. Hodges. 1995a. Location and Characteristics of spectacled eider molting and wintering areas, 1993-94. Unpublished progress report. U.S. Fish and Wildlife Service. Anchorage, Alaska. 23pp.
- Larned, W., G. R. Balogh, and M. R. Petersen. 1995b. Late winter distribution of spectacled eiders (*Somateria fischeri*) in the Bering Sea, 1995. Unpublished report, U.S. Fish and Wildlife Service, Anchorage, Alaska. 19pp.
- Petersen, M. R., D. C. Douglas, and D. M. Mulcahy. 1995a. Use of implanted satellite transmitters to locate spectacled eiders at-sea. *Condor* 97:276-278.
- Petersen, M. R., W. W. Larned, D. C. Douglas, and D. M. Mulcahy. 1995b. Unpublished progress report. U.S. Fish and Wildlife Service. Anchorage, Alaska. 13pp.

Table 1. Estimates of selected waterbirds and marine mammals observed during an aerial offshore survey in Ledyard Bay, Alaska, 20 September 1995.

	N Observations	Total Estimate	Mean Group size	Range Group size
Pacific loon	6	15	2.5	1-9
Black-legged kittiwake	28	44	1.6	1-10
Sabine's gull	6	8	1.3	1-3
Glaucous gull	6	6	1.0	1
Spectacled eider	328	7,598	23.2	1-500
Pacific walrus	1	1	1.0	1

Table 2. Estimates of selected waterbirds and marine mammals observed during an aerial offshore survey in Ledyard Bay, Alaska, 21 September 1995.

	N Observations	Total Estimate	Mean Group size	Range Group size
Yellow-billed loon	2	3	1.5	1-2
Pacific loon	4	5	1.3	1-2
Red-throated loon	1	2	2.0	2
Black-legged kittiwake	19	23	1.2	1-3
Sabine's gull	1	1	1.0	1
Glaucous gull	7	9	1.3	1-2
Spectacled eider	222	33,192	149.5	1-2,000
Whale spp.	2	2	1.0	1
Seal spp.	100	127	1.3	1-10
Pacific walrus	3	3	1.0	1

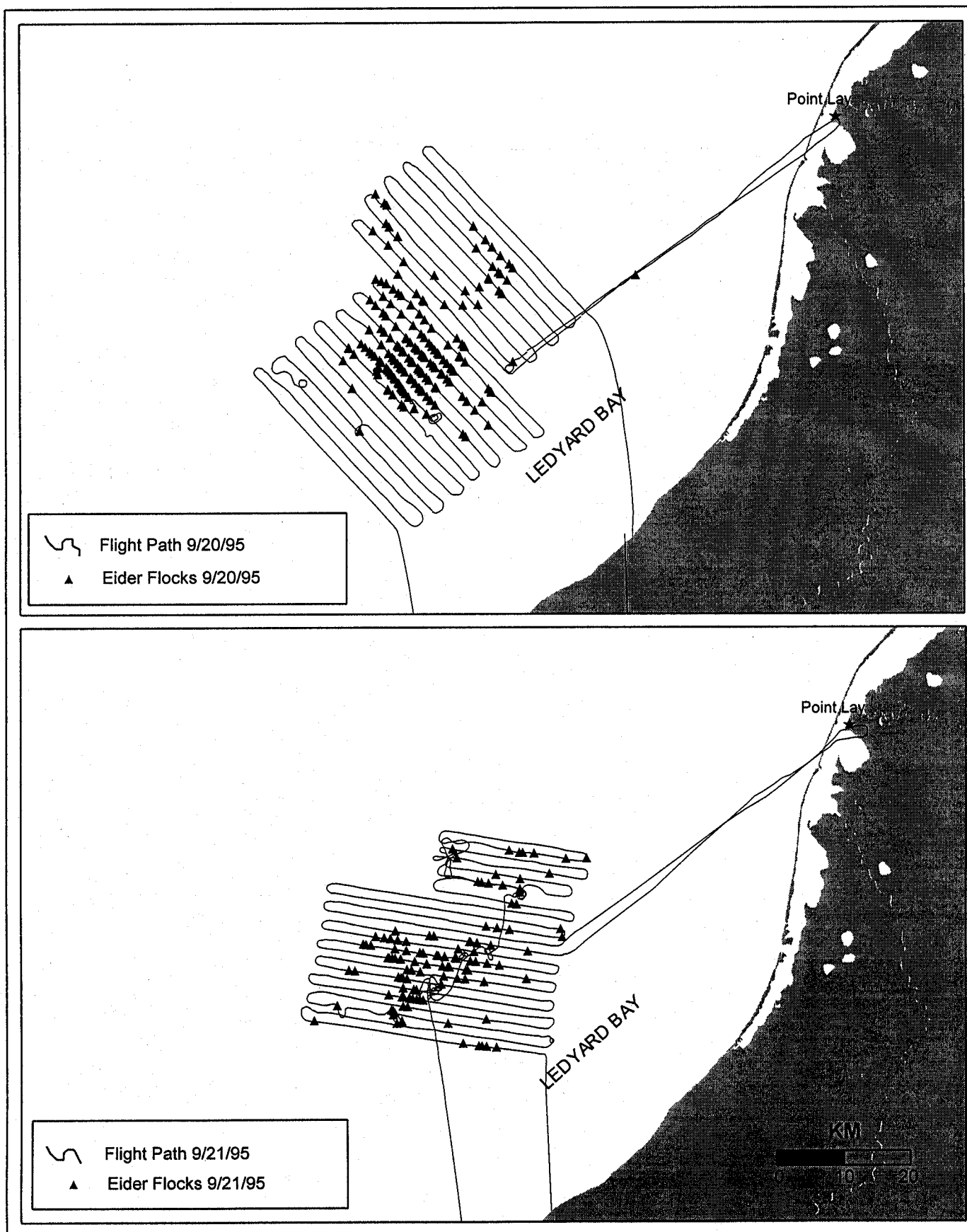


Figure 1. Recorded flight paths from aerial surveys in Ledyard Bay, Alaska, 20 and 21 September 1995, showing location of spectacled eider observations.